

Freescale Low Power Wireless Charger AMF-IND-T0804

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Market View



- Verizon
- •136 Members
- Complete supply chain
- Power scalability to 120W
- Resonance (via Power by Proxie & Fulton)
- Distances scalable up to 4cm
- Operating frequency 105 205kHz
- Currently supported by global telecom operators (Verizon, Orange, Docomo)
- Freescale contributing member



- Qualcomm & Samsung
- Magnetic Resonance @ 6.78MHz
- Distance of a few cm



- •AT&T
- Inductive Charging
- Resonance (via Witricity)
- Incompatible with Qi
- Distance up to several cm
- Operating frequency 300 350kHz
- Freescale member



WIRELESS POWER

CONSORTIUM

Qi Products Available Today









Nokia Lumia 920, 820













DROID ™ Bionic







HTC Rezound™



HTC ThunderBolt™



HTC Incredible 2™





Pantech **Breakout**

DANTECH









Motorola DROID™ 3



Sharp STYLE SH-05D



Samsung DROID ™ CHARGE



Verizon (LG) charge pad



LG Lucid™



LG Revolution™

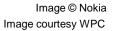


Eluga™ V P-06D



Sharp AQUOS™ f-SH13C







...deployment of wireless charging infrastructure





WPC Qi Technology Roadmap

- Current specification includes up to 5W
 - Enable mobile phone market
 - Additional features such as foreign object detection
 - Full flexibility on the device side
 - Wide range of transmitter types available
- Extending the Qi low power specification to 15 Watts
 - Enables fast phone charging
 - Align with increased power requirements of smart phones
 - Enable wireless charging for new class of devices
 - Est. spec delivery Q4'13
- Medium power: 30-120 Watt
 - Enables charging of tablets and notebook computers
- High power: up to 2000 Watt
 - Enables wireless kitchen appliances





Freescale Wireless Charging Solutions



Broad Flexibility - Configure and customize through easy-to-use API providing maximum differentiation

Accelerate Time-to-Market – Market-ready reference designs and productized software components

Compliant & Beyond – Leading contributor to the Qi standard, as well as providing multi-protocol support



Freescale Wireless Charging Market Segments



Automotive



Radios



Medical





Consumer



Industrial



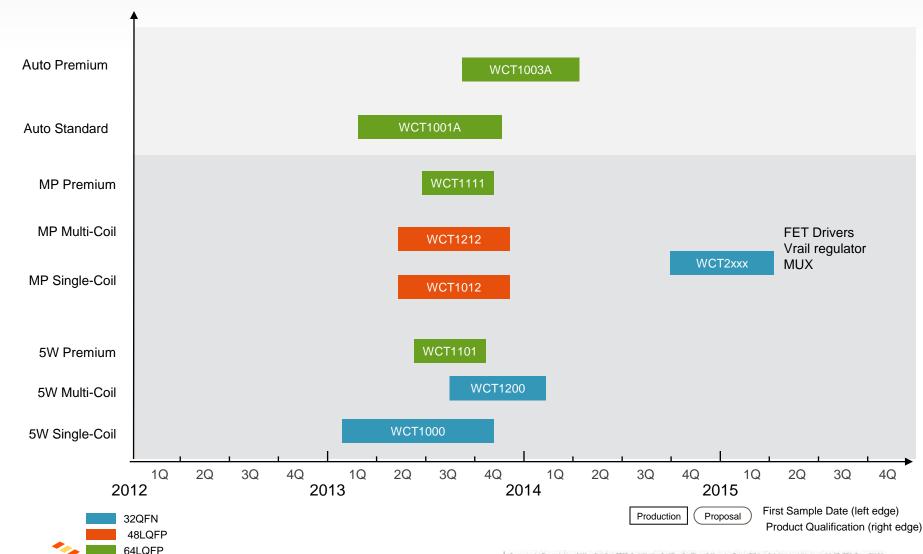
Power Tools



Wireless Charging Transmitter Roadmap

Features / Complexity

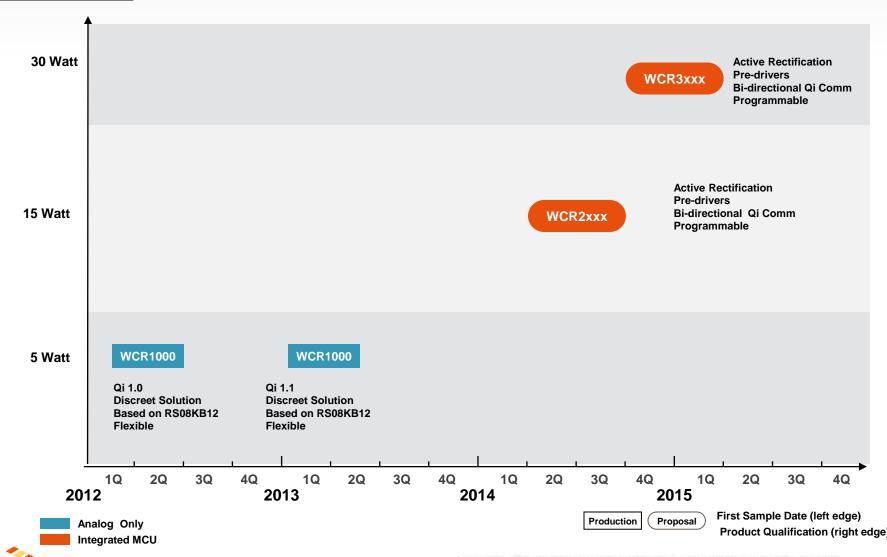
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Wireless Charging Receiver Roadmap

Features / Complexity

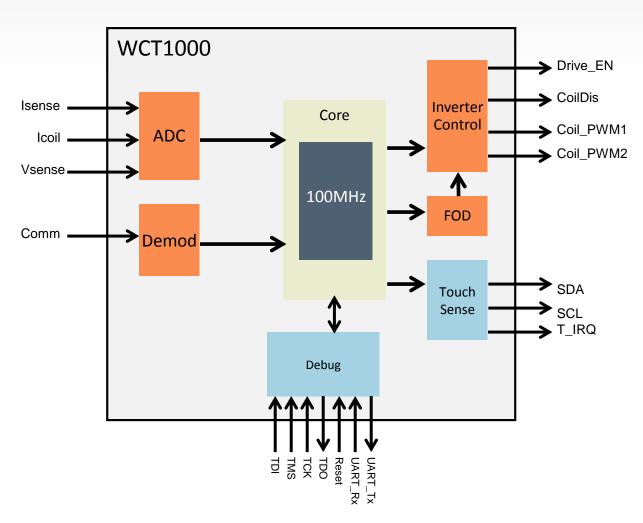
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WCT1000 – Single Coil Transmitter

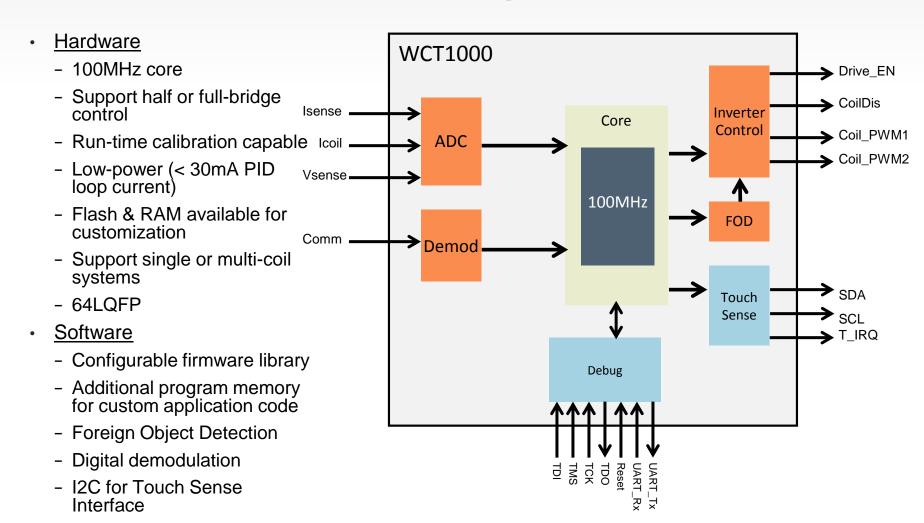
Hardware

- 100MHz core
- Support half or fullbridge
- Run-time calibration capable
- Low-power (< 30mA PID loop current)
- 32QFN
- Software
 - Configurable firmware library
 - Foreign Object Detection
 - Digital demodulation
 - I2C for Touch Sense Interface





5W Transmitter – Premium Option





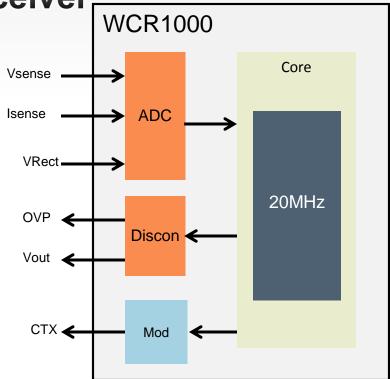
Wireless Charging Receiver

Hardware

- Support s full 1A output @ 5V
- Programmable interface
- Modulation Control
- System safety monitoring
- Output disconnect control
- 4 x 4 QFN24

Software

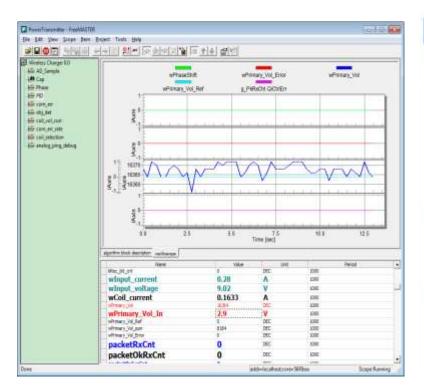
- Qi communications protocol
- Battery charging algorithms (NiMH, LiION)
- Foreign Object Detection (FOD) support

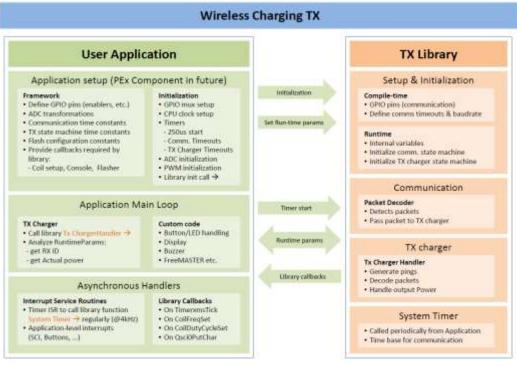




Freescale Wireless Charging Firmware Library

- Modify parameters on-the-fly using analysis tool (e.g. FSL's FreeMASTER)
- Tune the system to optimize performance
- Add additional application code (via Freescale API)
- Create true differentiation by customizing your wireless charging product







Freescale Proof-of-Concepts

Medium-power Industrial



- Charges 4x 11.2V / 4.8Ah battery packs simultaneously
- 80% transfer efficiency
- 56F8257 / QB8 MCU

5W consumer Rx



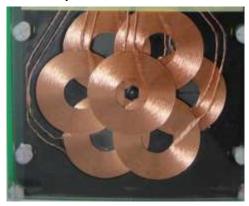
- True 5W power delivery
- Qi-1.1
- Discreet solution offers better thermal mgt

Medium-power consumer



- Provide 25W of power transfer
- 80% transfer efficiency
- Implements basic foreign-object detection
- 56F8257 / QB8 MCU

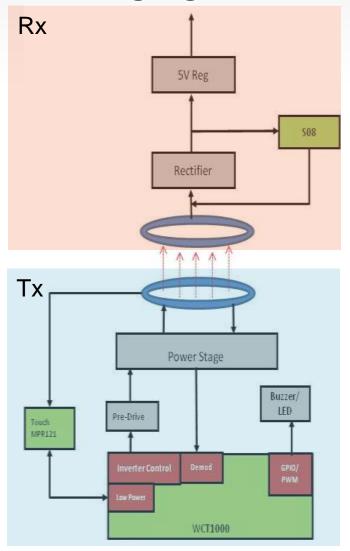
Low-power consumer



- 5W solution
- 7-coil array for free position
- 56F8006

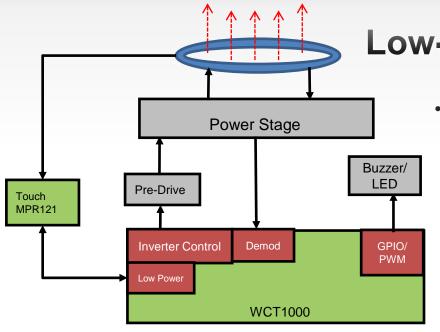


Charging Technologies



9		
TECHNOLOGY	POSITIVE	NEGATIVE
CONDUCTIVE • Traditional - Metal Contact • All Charging Devices	Lowest CostUSB is a universal standard	Only one device at a timeTetheredCable clutter
INDUCTIVE COUPLING • Coupling between coils • TI, IDT, FSL • Largest Installed base	 Convenience Multiple device charging at the same time Perceived Green Solution 	 Higher cost when compared to traditional Standards: PMA vs. WPC
MAGNETIC RESONANCE • Tuned coils • IDT, Qualcomm, FSL?	 Most Convenient [Spatial Freedom] Multiple devices charging at the same time Perceived Green Solution 	 Safety Concerns Highest cost among these 3 Lower efficiency vs Inductive Standards: A4WP vs. PMA vs. WPC





Low-cost Consumer Transmitter

- WPC A11 5W Charger for Consumer Applications
 - Rev. 2 alpha sampling July '13
 - Kit includes schematic, BOM & design files
 - Configurable library file for system tuning
 - Premium version available for application layer programming

Features	Benefits
Up to 7.5W output power	Deliver full 5W to receiver
Up to 77% transfer efficiency	Lower thermal footprint
Supports FOD per WPC 1.1 spec	Detect foreign objects to maximize user experience
Wide input voltage tolerance (4.25 – 5.6V)	Operates under flexible input supply voltages
MCU run power < 30mA / Stby @ < 5mA	Achieve ultra-low power consumption during operation
LED & buzzer for alignment options	Low-cost alignment indicators for users
BOM cost est. < \$5.00	Highly competitive price-to-value solution



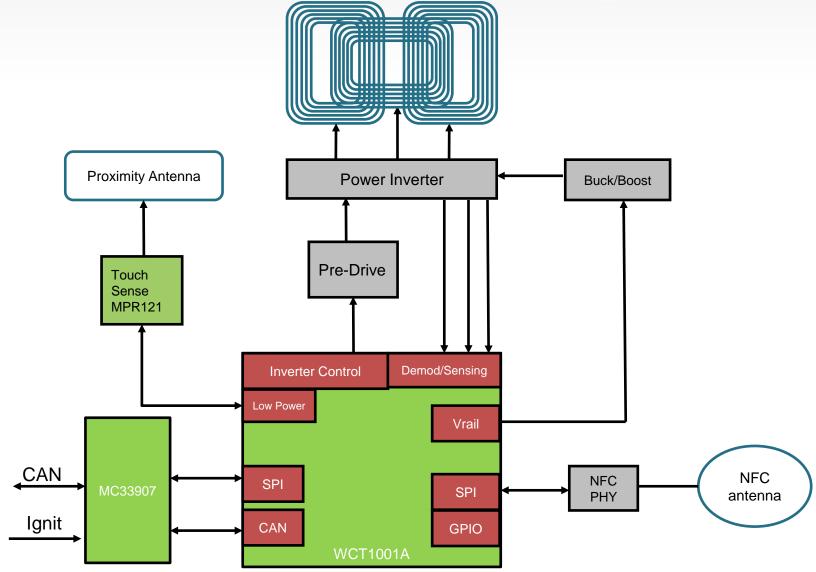
Feature Rich Automotive Reference Design

- WPC A13 Automotive Charger
 - Rev. 2 alpha sampling July '13
 - Kit includes schematic, BOM & design files
 - Configurable library file for system tuning & application layer programming

Features	Benefits
Up to 7.5W output power	Deliver full 5W to receiver
> 70% transfer efficiency	Lower thermal footprint
Supports FOD per WPC 1.1 spec	Detect foreign objects to maximize user experience
Low operational & Stby power using touch sense interface	Achieve ultra-low power consumption during operation
Integrated CAN bus support	Lower BOM cost
Fixed frequency operation	Avoid key FOB frequency interference
Meet CISPR 25 requirements	Improved EMI protection to meet auto standards
NFC capable	Implement NFC use case & show coexistence with Qi
Dual-Mode Capable	Support both Qi & Powermat protocols
AECQ-100 Level 2 qualified	Automotive qualified



Automotive Qi Transmitter Block Diagram





Portfolio Schedule

WCT1000/1101

- Reference Design Availability Now
- Software Availability Now
- Silicon Sample Availability -- Now
- Production Availability October '13

WCT1001A/1003A

- Reference Design Availability Now
- Software Availability Now
- Silicon Sample Availability Now
- Production Availability November '13

Documentation

- Datasheets September'13
- Reference Manual October'13
- Code Warrior Dev Kit -- Now



Freescale Value Proposition

- Broad Flexibility
 - Configurable hardware for added features
 - Ability to add differentiating features via software add-ons
- Application-Specific Technology
 - DSC core technology optimized for wireless charging transmitters
 - Software IP focused on efficiency & X/Y/Z freedom
- Speed Time-to-Market
 - Market-focused solutions
 - Productized software components
 - Wireless charging expertise



